On Farm Water Budget

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On Farm Water Budget

- Develop constraints for adjustable on farm water budget parameters
  - Canal seepage (cnl)
    - Conveyance loss
  - Efficiency (Eff)
    - maximum achievable efficiency that a farmer could attain under water short conditions before further shortage in irrigation supply would cause a reduction in the number of acres irrigated.
  - Deep percolation inefficiency (DPin)
    - fraction of the initial irrigation loss diversions x (1 - eff) that percolates below the root zone of the crop to the underlying aquifer under water short conditions.
  - Deep percolation excess (DPex)
    - fraction of excess applied water (farm delivery x eff minus ET) that percolates below the root zone. This is in addition to the deep percolation computed using the DPin parameter.

Canal Seepage

- Canal
  - In ESPAM2 most entities have canals
  - Adjustable by PEST through a scaling factor
- Recommendation
  - Fix for Surface Water Coalition
    - Presumed known
  - Allow minimal adjustment for others
    - Start scaling factor at 1.0
      - Adjust between 0.95 and 1.05
    - Have PEST keep adjustable scaling factors as similar as possible

Efficiency

- Eff - a function of crop mix, irrigation method, and soil type.
  - Potatoes would always have adequate water because farmers are aware they are sensitive to moisture stress.
    - The achievable efficiency for potatoes is probably in the range of the design efficiency for the particular irrigation application.
  - Alfalfa and grass hay are not as sensitive to moisture stress, and farmers will tend to short these crops by deficit irrigating them.
    - This can result in irrigation efficiencies for these crops that are greater than the system design values.
  - Grain crops fall in between potatoes and the hay crops, being able to tolerate some moisture stress.
  - Bryce prepared several spreadsheets to assist in analyzing the economic impact of deficit irrigation.
    - Spreadsheet were used to help develop constraints for PEST

Efficiency

- PEST adjust entity efficiency
- Recommendation
  - Eff start at 0.8
  - Adjust between 0.75 – 0.90

Disconnect Between On-Farm and Measured Returns

- In ESPAM1.1, return flows were computed as a percentage of the diversions
  - Return flows were subtracted from the historical diversion to compute the water available to supply crops and recharge the aquifer
- In ESPAM2.0, diversions are not reduced to account for return flows
  - MkMod works with full diversions
  - Canal seepage is computed as a percentage of the diversions
  - diversions after Canal seepage are delivered to the entities were Eff is applied
  - On-farm losses are apportioned between aquifer recharge and surface runoff (returns) using the DPin and DPex factors
  - Potential for differences between the computed surface runoff with the On-Farm algorithm and the return flows used in the reach gain calculations

Disconnect Between On-Farm and Measured Returns

- Recommendation options
  - Incorporate measured returns as targets
    - 2001 and forward for most entities
    - Some available in 1980s
    - Requires additional rewrite by Willem and checking by Jim.
  - Tightly constrain DPin = DPex = return fraction
  - Both A and B

Effect of Soil Moisture

- Soil moisture can provide an additional source of supply to the crops when the amount diverted is not sufficient to meet the immediate crop needs.
- The committee concluded that a soil moisture algorithm should be incorporated in the On-Farm Water Budget calculations
- Jim Brannon indicated that he would prepare a flow chart and test the algorithm in MKMOD4 using deficit, minimal, and excess water conditions.

END